parative smallness of the, lake come from higher strata of the atmosphere, and since this air has been but a brief time in contact with the surface of the water the lake breeze becomes constantly drier till the afternoon minimum from 2 to 4 P.M. The breeze thereafter diminishes in force, the air consequently becomes moister till the greater maximum is attained about the time of the day when the breeze from the lake falls to a calm. This special feature of the climate of Geneva well deserves the closest investigation, particularly in its relations to the curves of temperature, pressure, and clouds. Among the other points discussed may be mentioned an examination of Deville's cold and warm periods of the year by the long series of the Geneva Observations; a comparison of the temperature of the water of the Rhone, as it issues from the lake, with that of the air, showing the mean annual temperature of the water to be 3°·7 higher than that of the air, a point of some importance in connection with questions affecting oceanic circulation; the distribution through the year of strong northerly and southerly winds, and the variations, regular and irregular, in the amount and duration of the rainfall.

CLIMATE OF LUND.—A paper of considerable value has been published by H. A. V. Tidblom, in *Lunds Universitets Arsskrift*, tom. xii., on the meteorological observations made at the observatory at Lund from 1741 to 1870. The observations, which are very fully discussed, embrace the temperature, winds, rain, snow, thunderstorms, and auroras, and their great value lies in the long period, viz. 130 years, over which they extend. The highest observed temperature during the 118 years ending 1870 was 94°·1, and the lowest − 13°·9, both occurring in 1845. Northerly and easterly winds prevail in winter and spring, north-westerly in summer, and south-westerly in autumn—these winds being of special interest from their relation to the prevailing winds in the south of Norway in the corresponding seasons. Hail falls on an average 5 days in the year, snow 37 days, and rain 122 days. March is the month of smallest and least frequent, and August of greatest and most frequent rainfall. Thunderstorms reach the maximum in the last half of July and first half of August, very few occurring from the middle of October to the middle of April. The greatest number of auroras occur in April and September, and the variations through the different years are very great, a remarkable maximum period occurring from 1776 to 1790, since which latter date the number has been singularly few.

WEATHER SUMMARY.—M. H. Tarry's *Histoire de l'Atmosphère* for July and August, 1876, has been received. The publication, which recently began to be published in *Les Mondes*, aims at giving a summary and discussion of the meteorological elements of the northern hemisphere, which it is possible to collect within a month or two of their occurrence. It is thus calculated to be a useful supplement to the weather maps of Europe and America, and to the International Meteorological Observations of the United States, and as such it deserves the active support of the meteorologists of different countries.

INFLUENCE OF FORESTS ON OZONE.—In a note by M. L. Fautrat in the *Bulletin Hebdomadaire*, No. 475, of the Scientific Association of France, it is shown from observations made at Halatte and Ermenonville, that less ozone was observed in forests, particularly forests of pine, than in the open country, and more ozone at a height of 46 feet above the ground than near the surface.

NOTES

THE Loan Collection of Scientific Apparatus is to be finally closed on the 30th inst.

THE Danish Geographical Society enters upon its existence under royal auspices. In accordance with the invitation of the King of Denmark, the first public session was held in the royal palace at Copenhagen, on December 22, accompanied by appropriate festivities. The King has accepted the position of Protector of the Society, while the Crown Prince is active president.

THE veteran chemist, Prof. F. Wöhler, has been elected president of the German Chemical Society for the coming year.

A TELEGRAM received by M. Sidoroff from Capt. Wiggins, and communicated by the former to the St. Petersburg papers, announces that on December 13 Capt. Wiggins and his shipmaster, M. Svanenberg, left Krasnoiarsk on their way to St. Petersburg.

OUR readers may remember that at the International Conference on the means for exploring Central Africa thoroughly and systematically, held at Brussels last September under the presidency of the King of Belgium, invitations were issued to the different countries represented to form local committees for the furtherance of this object. The German National Committee was formed last week under the presidency of Prince Henry VII. of Reuss, and embraces many of the most distinguished names in the empire. A committee has already been intrusted with the duty of preparing the statutes for a permanent association, the German Society for African Exploration, which is to be under the patronage of the Crown Prince, and expects to enter vigorously and energetically upon its chosen field.

THE *Daily News* correspondent at Rome writes that the Marquis Antinori has sent to the Italian Geographical Society a long account of the journey of the Italian African Expedition of which he is leader. The expedition has, after many hardships and delays, reached Shoa, the king of which has received the members in his capital, Liccé, with the greatest hospitality. The Marquis has taken steps to make Shoa a scientific *entrepôt*, as a basis of operations for exploring the equatorial lakes. When the letter left the Marquis was preparing an extended scientific report of his journey to be forwarded to the Italian Society by a courier.

IN the last session of the Berlin division of the German and Austrian *Alpen-Verein*, Dr. Scholle delivered an elaborate address on the orography of the Bernese Alps. He regards them as distinguished from the mountains of other alpine regions by the following peculiarities:—The valleys are unusually deeply cut. The mountains inclosing these valleys are remarkable for their relative as well as their absolute heights, and the horizontal projection of their tops lies always at but a short distance from the bottom of the valleys. Finally, the topmost points of the mountains are generally visible from the valleys, and their commanding appearance imparts to the landscape its most picturesque and magnificent features.

THE *Bulletin* of the French Geographical Society for November contains a paper by Dr. Jules Carret on the Displacement of the Polar Axis, in which he gives a summary of arguments in favour of displacement which will appear at length in a work about to be published by him.

THE following particulars are given by Prof. Desor in the last number of the *Bulletin* of the Society of Natural Sciences at Neuchâtel, as to the burial-ground of the inhabitants of the lake-dwellings discovered last winter on the shores of the Lake of Neuchâtel at Auvernier. The burial-place is about 100 feet distant from the well-known lake-dwellings of this locality, at the foot of a hill, and it was shut up by some 7 feet of earth washed by rains from the slopes of the hill. It has a quadrilateral form (1·6 metre long and 1·12 broad), and is built of flat granitic stones covered with two large flag stones of gneiss, these last necessarily having been cut artificially. The burial-place thus belongs to that class of dolmens which are known in England as "stone-cists," and it establishes therefore a new link between the true dolmens and the lake-dwellings. Assiduously watching the excavation, Prof. Desor ascertained that he had really to do with a grave (that of a family, or of a clan), not merely with a receptacle of bones, the relative positions of bones proving that complete corpses were deposited in the grave, probably in a sitting position. The number of individuals buried must have been from fifteen to twenty. It was very difficult to obtain well-preserved skulls, the bones being much deteriorated and the excavations not having been made with the desirable accuracy; but some better preserved skulls show a close likeness to those found in other lake-dwellings, and especially to the skull of this kind described by MM. Rutimeyer and His in their "Craniologie Helvétique;" they belong to the mesaticephalous (semi-long) form known as the "Sion group," which form is also the true Helvetic. This form, which has been found in the stone age, continues to appear throughout the bronze and stone ages, constantly increasing in size, and showing a more and more developed, higher and broader, forehead; and it differs from the present Helvetic form not in kind but only by the degree of its development. The implements found in the grave are stone and bone implements belonging to the age of polished stone. But along with them were also found bronze implements (a perforated disc, a ring, and a pin), which thus establish the long missing link between the lake-dwellings of the stone age and those of the bronze age, both of which have representatives at Auvernier. The importance of the Auvernier grave is thus very great, as it gives new proofs in support of the alleged unity and continuity of races of prehistoric man during the stone age and that of the bronze. Some bronze implements implying a somewhat higher degree of culture, together with a bead of yellow amber and a skull, were found in the neighbourhood of the grave, on a somewhat higher level; they belong probably to a more recent period. It is proposed by the Neuchâtel Society to undertake further excavations in the same locality.

THE earthquakes which were felt in the Canton of Neuchâtel last spring (from April 2 to May 16) are the subject of two interesting communications by Prof. Desor and Dr. Tribolet, published in the last number of the *Bulletin* of the Neuchâtel Society of Natural Sciences (vol. x. part iii.). Dr. Tribolet, in addition to particulars of the earthquakes of this year, gives also a list of those known to have been felt in the canton since 1313. From this list we see that earthquakes were especially numerous during the seventeenth century, comparatively rare during the eighteenth, and totally wanting during the first half of this century, until 1852, when they begin anew to be frequent, twenty-four shocks having been felt from that year to the end of 1875. The earthquakes of last spring began with a strong one on April 2, at 5.55 A.M.; a second shock followed on April 30, and then, until May 16, no less than eleven shocks were felt in the canton at short intervals. The region of the shocks was generally limited, only two of them having been felt beyond the frontiers of the canton. As to their causes, Professors Desor and Studer, and Dr. Tribolet come unanimously to the conclusion that they have nothing to do with volcanic causes; but that the rocks of the Jura, forming a varied series of harder and softer strata, the latter mostly undermined by subterraneous streams and numerous caverns, it is very probable that the earthquakes are due to the crumbling of undermined strata, the seat of these crumblings being probably at a depth of about 1,400 feet, where friable dolomites and saliciferous marls are covered with hard muschelkalk. The exceptionally abundant rains of last spring must have contributed to the saturation of rocks with water.

PROF. LIVERSIDGE, of the University of Sydney, has published a report on the disease known as "rust" which has been causing great havoc among the sugar-canes in Queensland. This disease appears to have been first observed in the colony in 1870. Though most of the varieties of cane seem to have been more or less affected, the Bourbon was the one upon which the disease was first noticed, and this kind has since suffered more than any other; soil and climate have also assisted its progress in a marked degree; thus it is said to have been almost exclusively confined to dry, porous, sandy soil, and to have been more virulent after unusually wet and cold seasons. The juice obtained from diseased canes shows a lower density than that obtained from healthy ones, and the sugar is more difficult to make. With regard to his microscopical examination of the diseased canes, Prof. Liversidge says he failed to detect anything which could possibly be considered as the cause of the disease; though the canes were affected by minute fungoid growths, they were not sufficient to account for the actual disease, and were undoubtedly the consequence and not the cause. Red spots are found on all the plants, healthy as well as unhealthy, but more abundantly on the latter. It is to the presence of these red spots that the name of *rust* has been applied generally to the disease in Queensland. The fungoid growths are said to bear a very strong resemblance to a large group of very common microscopic fungi—the *æcidiacei*, to which order they are said probably to belong. Notwithstanding the prevalence of these fungoid bodies, and after a minute examination and analysis of various soils, the author of the report arrives at the conclusion that the disease has not been due to any one cause but rather to a combination of numerous complex, and more or less obscure causes, which are attributed to the system of cultivation adopted by the planters, the land being exhausted without a proper return being made to it.

IMPORTANT results have been obtained by parties of the United States Geographical Survey west of the hundredth meridian, under Lieut. George M. Wheeler, corps of engineers, in geology and natural history, Mr. H. W. Henshaw, the zoologist of the California Section, having made large collections of the vertebrate fauna, including every family of birds occurring in the West. The streams explored in Nevada and California were found to abound in fishes of the genus *Catostomus*, and among the specimens collected it is not improbable some species may be found that are new to science. In the reptilian collection are several snakes belonging to the genus *Eutania*, and a new species of lizard. In entomology the *Orthoptera* and *Coleoptera* are largely represented, including some rare species from the Alpine mountain region. Careful investigations were made in geology by Mr. A. R. Conkling, and the collections made taxed the facilities for transportation, the rocks gathered being chiefly igneous and metamorphic, including syenite, granite, basalt, &c. The predominating rock in the region thus far examined by the California scientific expedition is grey syenitic granite, containing numerous crystals of black hornblende. Several mines were explored and described in detail. In palæontology there were few collections, fossiliferous formations being rare. From the sandstone quarries in Ormsby County several specimens of the genus *Unio* were obtained, these tertiary fossils being the only representatives of extinct fauna observed.

WE have received a paper, "On the Larger Divisions of the Carboniferous System in Northumberland," by Mr. G. A. Lebour, being a reprint from the *Proceedings* of the North of England Institute of Mining and Mechanical Engineers, vol. xxv. Discussing the stratigraphical characters of the different members of the Carboniferous series, the author advocates a new subdivision of it into two stages, an Upper and a Lower, instead of the three adopted now; the blending together under a common name of "Bernician" of the Yoredale Rocks, the Scar Limestone series, and the Calcareous and Carbonaceous groups which are incapable of natural division, and the additions of the Tuedian and of the so-called Upper Old Red to the Lower Carboniferous beds. A plate showing the stratigraphical changes undergone by the Carboniferous series from Derbyshire to Berwickshire, on which the views of Mr. Lebour are based, accompanies the paper.

The General Council of Hautes-Alpes has decided to organise a special meteorological service for the purpose of carrying out the system of weather-warnings for agriculture for that department analogous to what have been established in other departments of France. The height and other physical peculiarities of the department make this a valuable addition to this system of warnings which is being gradually established over France with marked success.

A memoir on the Ophite of Pando, in the province of Santander, by Don Francisco Quiroga y Rodriguez, which has just been published in the *Anales de la Soc. Esp. de Hist. Natural.*, is of considerable interest to petrographers, as it discusses the microscopic structure and mineralogical constitution of a rock of decidedly peculiar character, and at the same time enables us to realise the points of resemblance and difference between it and the similar rocks of the Pyrenees, described by Prof. Zirkel, and those of the province of Cadiz, concerning which Mr. Macpherson has recently given us such very interesting details. The rock in question is suspected to be of Triassic age, and among other features of interest presented by it we may mention the existence in it of a mineral which appears to possess characters intermediate between those of augite and diallage.

The following further Saturday evening lectures have been arranged for in connection with the South Kensington Loan Collection of Scientific Apparatus. We do not yet know whether the closing of the Collection will interfere with their delivery:—December 30.—Prof. W. F. Barrett, on "Some of the Practical Applications of Electricity as Illustrated by Instruments in the Loan Collection." January 6.—Alexander J. Ellis, F.R.S., on "The Nature of Chords in Music, illustrated by Appunn's Apparatus." January 13.—Dr. B. W. Richardson, F.R.S., on "Stephen Gray and the Discovery of Electric Conduction." January 20.—Prof. Garrod, on "The Instruments exhibited by M. Marey, specially with reference to the Flight of Birds and Insects." January 27.—W. Chandler Roberts, F.R.S., on "The Means adopted for securing the Accuracy of the Coinage." February 3.—Prof. Osborne Reynolds, on "Vortex Motion." It is intimated that the Collection will be closed after Saturday, the 30th inst.

We are glad to see that an effort is being made to give the people of Hertford some knowledge of science, of the value of which they seem somewhat ignorant. Mr. Percy Smith and Mr. Vincent Elsden have commenced a course of experimental lectures on Chemistry and Physics, which, to judge from the syllabus, is likely to prove both interesting and instructive to those who are wise enough to attend.

The curious phenomenon of a ball being supported in air by a strong air current directed obliquely 35° to 40° from the vertical, has lately been exhibited in Philadelphia. Various explanations of it have been attempted by engineers and others. M. Reuleaux (in *Poggendorff's Annalen*), rejecting previous explanations, offers the following:—The pretty thin air current, on reaching the ball, is deflected on all sides, and therefore more or less rarefied in its interior. Accordingly the atmosphere presses the ball in the direction of the greatest rarefaction, or the mean force of the rarefactions, towards the orifice. The weight of the ball acts vertically downwards. Equilibrium occurs between the obliquely-acting force of the current and the two forces just named, when the mean force of the latter is parallel to the action of the current. This can only take place when the ball has its centre under the axis of the current. There is then a pair of forces which put the ball in rotation. If the finger or a rod be brought to the place of supposed minimum pressure on the ball, the latter is forthwith driven off (as the vacuum is destroyed) or falls down.

From a recent report on the cultivation of the vine in Madeira we are told that the *Phylloxera vastatrix* has partially attacked and destroyed many plants in some districts, but the evil has no discouraged the renewal and extension of plantations. The improved method of treating Madeira wines have rendered them more agreeable to the prevailing taste of consumers, and the demand for them is steadily increasing in every market. In Teneriffe many landowners have likewise turned their attention again to the cultivation of vines, and the wines of the island are thus increasing annually in quantity. The *Oidium* is gradually dying out, and where it still appears is successfully checked by sulphuring. The *Phylloxera* has as yet not appeared in any of the vineyards.

From the Annual Report on the Brisbane Botanic Garden, we gather some valuable and interesting facts relating to the acclimatisation of economic plants. Of the three most extensively cultivated tropical plants—sugar, coffee, and tea, we learn that at present forty varieties of sugar-cane are grown in the garden, and that there is such a large and continuous demand for plants of such varieties as are known to be not yet subject to disease, that the director has recommended the setting apart from the Botanic Garden of a piece of ground to be used as a nursery for sugar and other plants of commercial value. It is satisfactory to know that with regard to coffee the plants of the ordinary kind (*Coffea arabica*) in the experimental plantatation are all healthy, and show not the slightest sign of disease either from the *Hemileia vastatrix*, or any other cause. The northern districts, especially the sheltered ridges of the Hubert and Endeavour rivers are said to be the most suitable to the profitable cultivation of coffee, and some thirty acres of land on the Lower Hubert is to be put under this cultivation during the ensuing season. Of the Liberian kind (*Coffea liberica*) some seeds have been sent from England, and these are growing into perfectly healthy plants, some of which, indeed, have been already distributed. Though the tea plantation is reported to be in a flourishing condition and numbers of plants have been distributed, the cultivation of tea, it is said, does not attract the attention it deserves owing to the high price of skilled labour required in the preparation of tea as a commercial article. Among other plants of interest introduced to the Garden may be mentioned the Paraguay tea (*Ilex paraguayensis*), which seems to be thoroughly well adapted to the climate of Queensland. Mr. Hill reports that the demand for it has of late very largely increased. The Balsam of Tolu (*Myroxylon toluifera*), the new tanning plant (*Balsamocarpon brevifolium*), the Sumatra rubber-plant (*Urceola elastica*), and the Siam Gamboge (*Garcinia morella*, var. *pedicellata*), all seem to be doing well. The consideration of the introduction of foreign grasses and other plants as well for fodder purposes as for renovating old pastures, has occupied some attention in Queensland, and the result is that many of our well-known meadow-grasses as well as the *Trifoliums Medicagos*, and *Melilots* have established a similar reputation in the new to that which obtains in the old. The only unsatisfactory part of Mr. Hill's report is that in which he tells us of the destruction and probable extermination of indigenous plants. Thus, in certain districts within the Colony, some trees formerly plentiful have almost disappeared, or are but rarely found. The Queensland Nut (*Macadamia ternifolia*) is an instance, in districts abounding with it some years ago, it is now difficult to find even a single specimen. This has been caused in consequence of numbers of them having been cut down chiefly by South Sea Islanders for the purpose of more easily obtaining the fruit at the expense of the destruction of the tree. A similar fate seems to await the *Cycas media*. It is found between Port Denison and Cooktown, and the flour obtained from its seeds forms one of the principal articles of food, in certain seasons, of the aborigines of that part of the Colony. During the visit of the North-East Coast Expedition of 1873, quantities of it were found in the deserted camps, and unless preventive measures are promptly taken, from the wholesale destruction now going on, it will speedily share the fate of the *Macaaamia.*

AT the two meetings of the St. Petersburg Chemical Society, September 28 and October 19, many papers of interest were read. We notice among them a valuable report of M. Bogussky on his researches into the velocity of chemical reactions and on its dependence upon the degree of concentration of the solutions; a paper of M. Alekséeff on the mutual solubility of soluble liquids, the conclusions of which were, however, warmly criticised; a paper of Prof. Butléroff on the di-isobutylene, classing this body among the homologues of the etylene series; and of M. Kovalefsky on the amount of mechanical power disengaged during chemical reactions, those of the sulphates of copper and zinc having been begun with in the course of researches undertaken by the author.

MR. THOMAS SOUTHWELL, of the Norfolk and Norwich Naturalists' Society, writes with reference to our notice of Mr. Marsham's "Indications of Spring" (NATURE, vol. xv. p. 128), that this remarkable series of observations commenced in the year 1736, is still continued by the Marsham family. In 1789 Robert Marsham communicated his observations to the Royal Society, they were read on April 2 and printed *in extenso*, in the *Philosophical Transactions* of that year. Robert Marsham died in 1797, and the observations were continued by his son Robert to the year 1810. From that time till 1836, no record was kept, but in the latter year a third Robert Marsham resumed them, by whom, and his son, the present Rev. H. P. Marsham, they have been continued to the present time.

THE experienced Arctic cruiser, Mr. Lamont, writes to the *Times* of Tuesday in reference to Dr. Petermann's recent letter to the Geographical Society, expressing his decided conviction, founded on his own extensive experience and that of many other practical Arctic men, that all round the North as round the South Pole, there lies an eternal mass of ice a thousand miles in diameter, and perhaps miles thick in the centre. He does not believe that either "ship, sledge, man, beast, bird, or balloon, will ever get across it."

THE additions to the Zoological Society's Gardens during the past week include two Bonnet Monkeys (*Macacus radiatus*) from India, presented by Mr. Peter Varwell and Mrs. Leopold Evans; a Chinese Eyebrowed Thrush (*Leucodioptron canorum*) from China, presented by Mrs. Arabin; a Short-eared Owl (*Otus brachyotus*), European, presented by Mr. Josh. Lee; three Golden Orioles (*Oriolus galbula*), a Redwing (*Turdus iliacus*) European, presented by Mrs. A. H. Jamrach; a Dunlin (*Tringa cinclus*), European, presented by Mr. F. Cresswell; a Snowy Owl (*Nictea nivea*) from Lancaster Sound; a King Parrakeet (*Aprosmictus scapulatus*) from New South Wales; a Greater Sulphur-Crested Cockatoo (*Cacatua galerita*), from Australia, deposited.

SCIENTIFIC SERIALS

Poggendorff's Annalen der Physik und Chemie, No. 11, 1876.—On the nature of elastic reaction, by M. Braun.—On the gliding of gas on glass walls, by M. Warburg.—Report on experiments of Dr. Root of Boston, on penetration of platinum by electrolytic gases, by M. Helmholtz.—Researches on the heat phenomena in the galvanic battery, and on electromotive forces, by M. Edlund.—Electro-magnetic properties of unclosed electric currents, by M. Schiller.—On the reply of M. Schlösser and the asserted preferability of ebonite for the discs of influence-machines, by M. Holtz.—Observation on the division, among two acids, of the positive metal in a galvanic battery, by M. Fuchs.—On phenomena of motion in electrified surfaces of mercury, by M. Herwig.—On the galvanic behaviour of gold, and a new kind of Nobili rings, by M. Schiel.

THE *Naturforscher* (November, 1876).—From this number we note the following papers of interest:—On the transparency of the water of Lake Leman, by F. A. Forel.—On the meteoric iron of Nentmannsdorf, near Pirna (Saxony), by F. E. Geinitz.—On the absorption of albumen by the leaves of *Dionæa muscipula*, by A. Fraustadt.—On the simultaneous occurrence of sugar and oxalate of lime in plants, by G. Kraus.—On electrical dust figures in space, by E. Lommel.—On some experiments with plants in coloured light, by G. Kraus.—On the dependence of the co-efficient of interior friction of gases from temperature, by A. von Obermayer.—On ascending air-currents, by Herr Crompton.—On microscopical inclosures in South African diamonds, by E. Cohen.—On the deterioration of air through artificial light, by Friedrich Erismann.—On the mechanics of breathing and the circulation of matter in the animal body, by E. Pflüger.—On the chemical composition of beech-leaves and fir-needles in different states of development, by L. Dulk.

Morphologisches Jahrbuch, vol. ii. part 3.—On the skin and dermal sense-organs of Urodela, by F. Leydig, with four plates.—On the metamorphosis of Echiurus, by W. Salensky, one plate, giving four stages of development.—On the exoskeleton of fishes, part 1; a long and valuable paper, by O. Hertwig, with six plates, dealing with the exoskeleton of Siluroids and Accipenseroids.—Prof. Gegenbaur has another contribution on the morphology of the limbs of vertebrates.—R. Wiedersheim discusses "the most ancient forms of the carpus and tarsus found in existing amphibia."

Zeitschrift für wissenschaftliche Zoologie, vol. xxvii. Part 3.—On the development of the lower jaw in Mammalia, by Dr. J. Brock; a histological memoir.—An account of the anatomy of *Rhynchelmis limosella*, with four plates, by Franz Vejdovski.—On the organisation and minute structure of the Daphnidæ and other Cladocera, by Dr. C. Claus, with four plates.—Description of a new hydroid polyp related to Allman's family Pennaridæ, by F. E. Schulze.

THE *Journal de Physique* for November, 1876, contains papers on illumination of transparent and opaque bodies, by M. Lallemand; application of very thin layers of gold to cathetometers and other instruments of measurement, by M. Govi.—On the distribution of magnetism in cylindrical bars, by M. Bouty.—On the physical properties of gallium, by M. Lecoq de Boisbaudran.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, December 14.—Lord Rayleigh, F.R.S., president, in the chair.—Mr. R. F. Davis, B.A., and Mr. H. Weston Eve, M.A., head-master of University College School, were elected members.—Prof. H. J. S. Smith, F.R.S., read a paper on the conditions of perpendicularity in a parallelopipedal system (the subject was of interest to crystallographers as well as to mathematicians).—Mr. Glaisher, F.R.S., gave an account of a paper by Prof. Cayley, F.R.S., on the condition for the existence of a surface cutting at right angles a given set of lines. "In a congruency or doubly infinite system of right lines, the direction-cosines α, β, γ of the line through any point x, y, z, are expressible as functions of x, y, z, and it was shown by Sir W. R. Hamilton in a very elegant manner that in order to the existence of a surface (or what is the same thing, a set of parallel surfaces) cutting the lines at right angles, $\alpha\,dx + \beta\,dy + \gamma\,dz$ must be an exact differential; when this is so, writing $V = \int(\alpha\,dx + \beta\,dy + \gamma\,dz)$ we have $V = c$, the equation of the system of parallel surfaces, each cutting the given lines at right angles." The author obtains his results from the analytical equations of a congruency, viz., $x = mz + p$, $y = nz + q$, where m, n, p, q are functions of two parameters, and m, n, are given functions of p, q. The condition he gets for the existence of the set of surfaces is—

$$(1 + n^2)\frac{dm}{dy} - (1 + m^2)\frac{dn}{dx} + mn\left(\frac{dm}{dx} - \frac{dn}{dy}\right) = 0.$$

He verifies his results in the case of the ellipsoid.—Prof. Clifford, F.R.S., communicated two notes on the orthogonal transformation, and additions to former papers on transformation of elliptic functions.—Mr. Tucker read portions of papers by Mr. F. W. Frankland (New Zealand), on the simplest continuous manifoldness of two dimensions and of finite extent, (communicated by Mr. Spottiswoode, F.R.S.).—On the theory